

The Key Holds the Answer!

Exploring Crystals and Fibers

Mobile Research Laboratory

Objectives:

- Create and use categories to organize a set of objects, organisms or phenomena (S4-1).
- Use a simple key to distinguish between objects (S4-4, S6-1).
- Devise a classification system for a set of objects or a group of organisms (S9-1).
- Distinguish between observation and inference given a representation of a scientific situation (S9-2).
- Compare and contrast the characteristics of specimens (S9-14).
- Examine, describe, compare, measure, and classify objects and mixtures of substances based on common physical properties. (S4-5)
- Implement the use of technology to discover, interpret and relate scientific data

Strategies:

- Students will use and interpret a Dichotomous Key.
- Students will review terminology associated with crystal systems and fibers.
- Students will observe specimens using the intel play, compound light and dissecting microscopes and compare/contrast characteristics.
- Students will observe specimens using the Personal Scanning Electron Microscope (PSEM) and compare/contrast characteristics.

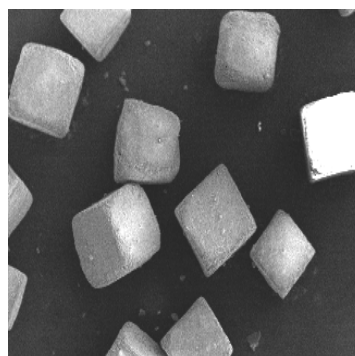
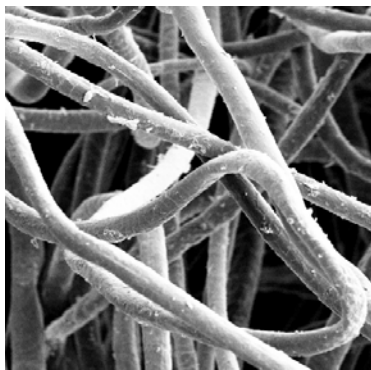
Lesson Objective:

Students will gain an understanding of the organization of a dichotomous key while exploring the similarities and differences between light microscopes and electron microscopes.

Specimens Observed:

- Crystals: Iodized Salt, Sea Salt, Epsom Salt, Powdered Sugar, Brown Sugar, White Sugar
- Fibers: 100% Cotton, Felt, Notebook Paper, 100% Cotton Velveteen, Paper Money, Photo Paper, Polyester

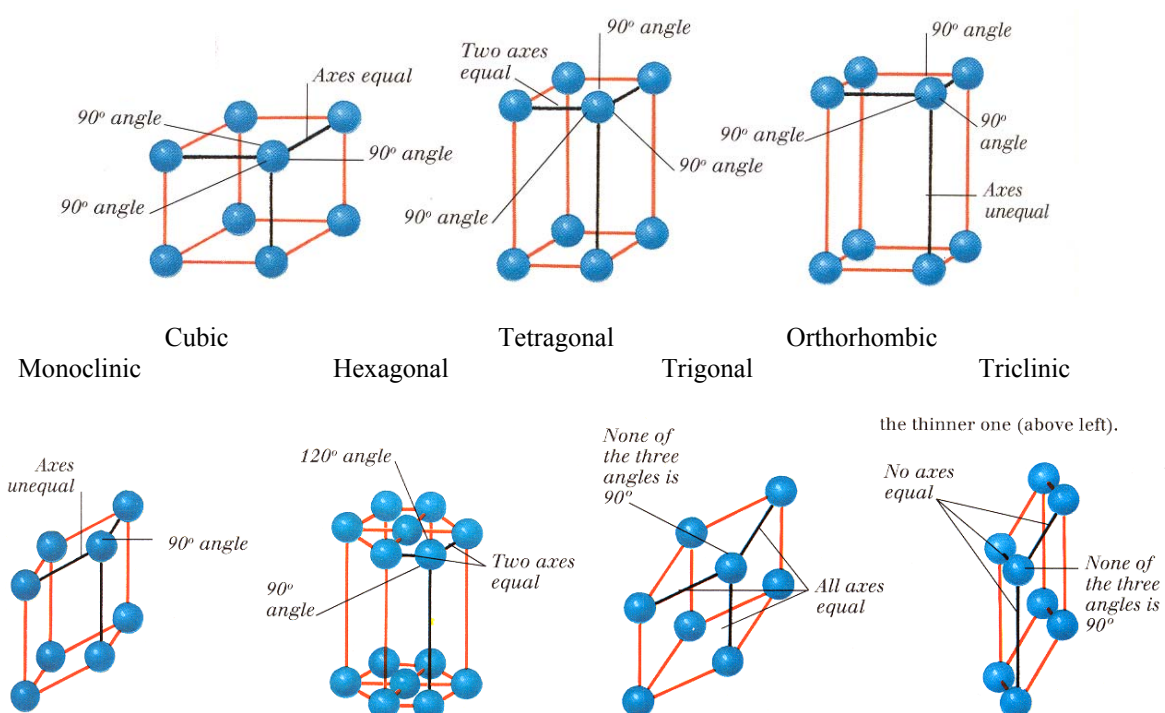
Fibers



Crystals

Vocabulary:

- Axis – an imaginary line about which an object has symmetry
- Clumpy – stuck together with no pattern, cluster of clumps
- Crystal – a clear, transparent mineral or solidified form of a substance which is arranged in a definite repeated pattern
- Crystal System – patterns of crystals – cubic, hexagonal, rhombohedral, tetragonal, orthorhombic, monoclinic, triclinic
 - ❖ Cubic – a solid with six equal, square sides, all angles 90°
 - ❖ Hexagonal – six-sided base or section
 - ❖ Rhombohedral – six-sided prism, each face is a rhombus
 - ❖ Tetragonal – three axis intersect at right angles, two of which are equal length, faces are tetragons
 - ❖ Orthorhombic – three axis of unequal length that intersect at right angles
 - ❖ Monoclinic – three axis of unequal length, two of which intersect at right angles
 - ❖ Triclinic – three axis of unequal length, no right angles
- Evident – easy to see
- Fiber – a slender thread-like structure
- Micrometer – 1 millionth of a meter
- Oblong – a rectangle, longer in one direction than the other
- Organization – patterns, being organized
- Pentagonal – five sided
- Powdery – fine, dust-like particles
- Separate – not stuck together
- Side – edge of a solid
- Shiny – reflecting light, polished appearance
- Specimen – object under investigation



PSEM DICHOTOMOUS KEY

Exploring Crystals and Fibers

Name _____

Look at a specimen under the PSEM. Follow the key to identify the specimen. When you reach your conclusion write the specimen # in the space provided. Continue this process for all 13 specimens.

(Key Tips: Remember to start each specimen at 1. Follow the directions carefully.)

- 1 – Does the specimen show fibers? (slender, thread-like structure)
If yes, go to 2
If no, go to 5
- 2 – Do the fibers have some organization to them?
If yes, go to 6
If no, go to 3
- 3 – Do the fibers look pressed together? (Flattened)
If yes.....
If no, go to 4
- 4 – Are the ends of the fibers pointing toward you?
If yes
If no
- 5 – Does the specimen show crystals? (a solid arranged in a repeated pattern, cubes etc.)
If yes, go to 8
If no
- 6 – Is the organization representative of pictures or words?
If yes
If no, go to 7
- 7 – Measure the diameter of several groups of fibers. (Threads) Does the diameter average over 300 micrometers?
If yes
If no
- 8 – Are the crystals separate (not clumpy)?
If yes, go to 9
If no, go to 10
- 9 – Do most of the crystals have a pentagonal face?
If yes
If no, go to 11
- 10 – Are the crystals in the clump small (diameter of less than 50 micrometers)?
If yes
If no
- 11 - Do the crystals have an oblong shape?
If yes
If no, go to 12
- 12 – Is the diameter of a crystal less than 1000 micrometers?
If yes
If no, go to 13
- 13 – Are the large crystals made up of small cubes?
If yes
If no, go to 5

LIGHT MICROSCOPE DICHOTOMOUS KEY

Exploring Crystals and Fibers

Name _____

Look at a specimen under the various light microscopes and hand lens. Follow the key to identify the specimen. When you reach your conclusion write the specimen letter in the space provided. Continue this process for all 13 specimens.

(Key Tips: Remember to start each specimen at 1. Follow the directions carefully.)

1 – Are crystals evident?

If yes, go to 2 _____

If no, go to 3 _____

2 – Are all of the crystals similar in size?

If yes, so to 6

If no _____

3 – Are fibers evident?

If yes, go to 4

If no, go to 9

4 – Are the fibers organized?

If yes, go to 5

If no _____

5 – Are the fibers a color?

If yes, go to 12

If no, go to 3

6 – Are the crystals clumpy?

If yes _____

If no, go to 7

7 – Are the crystals larger than 1 mm?

If yes _____

If no, go to 8

8 – Are all of the crystals cubical?

If yes _____

If no _____

9 – Is the specimen powdery?

If yes _____

If no, go to 10

10 – Is the specimen shiny?

If yes _____

If no, go to 11

11 – Does the specimen have pictures or words?

If yes _____

If no _____

12 – Are the fibers –

white? Yes _____

green? Yes..... _____

orange? Yes..... _____